

## LINEAR EQUATIONS WORKSHEET

### FINDING SLOPE FROM RISE AND RUN

➤  $\text{Slope} = \frac{\text{Rise}}{\text{Run}} = \frac{Y}{X}$       The letter that represents slope is  $m$ .

➤ Formula for slope:  $m = \frac{y_2 - y_1}{x_2 - x_1}$       Note: Two points are needed.

➤ The  $x$  value is always written first and the  $y$  value second.

Example:  $(-2, 3)$   $(4, 5)$        $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 3}{4 - (-2)} = \frac{2}{4 + 2} = \frac{2}{6} = \frac{1}{3}$

### SLOPE OF HORIZONTAL LINE

➤ The two **y coordinates** are the same causing the slope to be zero.

➤ Example:  $(2, -3)$   $(4, -3)$       (The line is horizontal across the  $y$ -axis, so  $y = b$ )

➤  $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - (-3)}{4 - 2} = \frac{-3 + 3}{2} = \frac{0}{2} = 0$

### SLOPE OF VERTICAL LINE

➤ The two **x coordinates** are the same.      Slope is undefined because we cannot divide by zero.

➤ Example:  $(3, -5)$   $(3, 2)$

➤ The line is vertical through the  $x$ -axis, so  $x = a$ ;  $a$  is the  $x$  intercept found by setting  $y$  to zero.

➤  $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - (-5)}{3 - 3} = \frac{2 + 5}{0} = \frac{7}{0} = \text{undefined}$

### STANDARD FORM OF A LINEAR EQUATION:

➤ Formula:  $Ax + By = C$

➤ When given a formula in slope intercept form such as:  $y = -2x + 2$ , rearrange into standard form of the line:  $Ax + By = C$  by doing the following steps:

$$\begin{array}{ll} y = -2x + 2 & \text{Add } x \text{ term to both sides} \\ +2x & +2x \\ 2x + y = 2 & \text{Clean up by rewriting.} \end{array}$$

### SLOPE-INTERCEPT FORM OF A LINEAR EQUATION

- Formula:  $y = mx + b$  where  $m$  is the slope and  $b$  is the y intercept where the points are  $(0, b)$
- When given an equation in standard form such as:  $2x + 3y = 6$ , rearrange into slope intercept form of the line:  $y = mx + b$  by doing the following steps:

$$2x + 3y = 6$$

$$-2x \quad -2x \quad \text{Subtract } 2x \text{ from both sides.}$$

$$\text{Example: } 3y = -2x + 6 \quad \text{Clean up by rewriting.}$$

$$\frac{3y}{3} = \frac{-2x}{3} + \frac{6}{3} \quad \text{Divide all terms by the coefficient of } y.$$

$$y = -\frac{2}{3}x + 2 \quad \text{Clean up by rewriting.}$$

### POINT SLOPE FORM OF A LINEAR EQUATION

- Formula:  $y - y_1 = m(x - x_1)$   $m = \text{slope}$
- The coordinates of  $x_1$  and  $y_1$  are taken from a given point: Example  $(-2, 3)$
- If given two points, first calculate the slope from the above formula.  
Example:  $(-2, 3)$   $(4, 5)$   $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 3}{4 - (-2)} = \frac{2}{4 + 2} = \frac{2}{6} = \frac{1}{3}$

Then, take the first point and the slope and plug into the point slope formula.

$$y - 3 = \frac{1}{3}(x - (-2)) \quad \text{Change the two negatives to a positive}$$

$$y - 3 = \frac{1}{3}(x + 2)$$

- If given slope and one point, plug into the formula as above.

### PARALLEL LINES

- If two different lines have the same slope ( $m$ ) and different y intercepts, they are parallel.
- Example:  $y = 2x + 4$  AND  $y = 2x - 5$

### PERPENDICULAR LINES

- If the slopes of two lines are  $m$  and  $-\frac{1}{m}$ , the lines are perpendicular.

$$y = 3x + 2 \quad \text{The slope of this line is } +\frac{3}{1}$$

- Example:  $y = -\frac{1}{3}x + 6$  The slope of this line is  $-\frac{1}{3}$